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Analyses of Oranges and Lemons from the Riverside Citrus Fair,

March, 1845.

These fruits, with the exception of those marked *a* and *b*, were received through the hands of Mr. Chas H. Dwinelle, on his return from the fair. All were in excellent condition and were worked during the days following April 3d, the day of receipt.

The samples marked *a* and *b* formed part of a collection received some time afterward, through the courtesy of Mr. J. E. Cutter, W. H. Backus, J. H. North and other exhibitors, of Riverside. They were kept on shelves in a room until May 15th, when the Navel had lost some of its original firmness and the Malta Blood was beginning to show shrinkage from drying. These samples had therefore been kept six weeks longer than the others, but were in good condition. Four of the navels still on hand at this date—May 22d—though soft to the touch are perfectly sound.

The data given in the table below explain themselves. Column No. 1 gives the average weight, in grams, of the fruit examined, usually two in number; a division by 30 gives this weight in ounces avoirdupois. Columns 2, 3 and 4 give the percentages of rind, pulp and seed respectively. It will be noted that the Navel and Malta Blood oranges and Eureka lemon were found seedless, the largest proportion of seeds being found in the St. Michaels' orange. Column 5 gives the per cent of juice in cubic centimeters, referred to the weight of the fruit in grams; and since the density of the juice is somewhat above that of water, this percentage, if taken by weight, would be a little higher than here given; but for the practical comparison the figures hold good. Column 6 gives the actual amount of juice obtained per single fruit, again in cubic centimeters, which, by division by the number 30 may be reduced to fluid ounces. Columns 7 and 8 give the percentage in the juice of cane sugar (sucrose) and fruit sugar (levulose), the sum of sugars being shown in column 9. Column 10, finally, gives the percentage of acid calculated as citric acid.

ANALYSES OF CITRUS FRUITS.

NAME.	ORANGES.	SUGARS.		Cane. Per cent.....	Juice. Per cent. c. cm.....	Seeds. Per cent.	Pulp. Per cent.	Rind. Per cent.	Average Weight in Grams.....	1	2	3	4	5	6	7	8	9	10	Acid. Per cent.		
		Fruit. Per cent.....	Total Sugar. Per cent.....																			
1.—Mediterranean Sweet.	288.0	33.5	65.6	0.9	41.42	111.5	.....	.....	.....	1	2	3	4	5	6	7	8	9	10	1.67	6.14	1.10
2.—Riverside Navel (a).	233.7	30.0	70.0	.....	.....	5.04	9.10	.....	.....	.....	2	3	4	5	6	7	8	9	10	7.14	.92	.....
3.—Riverside Navel (b).	158.0	17.3	80.1	2.6	52.58	82.7	4.47	4.47	1.96	3	4	5	6	7	8	9	10	11	6.43	.86	.....
4.—Paper Rind or St. Michael.	158.0	26.8	73.2	48.65	67.5	3.92	1.09	1.09	1.68	4	5	6	7	8	9	10	11	12	7.73	1.52	1.01	
5.—Malta Blood (a).	139.0	.....	.....	.....	.....	.....	.....	.....	.....	5	6	7	8	9	10	11	12	13	1.55	5.56	1.34	
6.—Malta Blood (b).	139.0	.....	.....	.....	.....	.....	.....	.....	.....	6	7	8	9	10	11	12	13	14	.....	.....	.....
7.—Lemons.	115.2	35.7	63.9	.4	43.40	50.0	.....	.....	.....	7	8	9	10	11	12	13	14	15	16	6.79	7.21	6.86
8.—Eureka.	157.0	22.4	77.6	.7	45.22	71.0	.....	.....	.....	8	9	10	11	12	13	14	15	16	17	7.53	30.3	6.86
9.—Limes.	133.5	15.9	83.4	.7	56.53	30.3	.....	.....	.....	9	10	11	12	13	14	15	16	17	18	30.3	30.3	6.86

1.—Mediterranean Sweet orange, from W. H. Backus.
2.—Riverside Navel orange, from John W. North. Taken from a plate of fine oranges which received the first prize for the best budded orange and best orange on exhibition.

3.—Riverside (or Australian?) Navel orange, from J. E. Cutter.
4.—Paper Rind or St. Michael orange, from W. H. Backus.

5.—Malta Blood orange, grower not mentioned.

6.—Same, grower not known.

7.—Lisbon lemon, from E. W. Holmes.

8.—Eureka lemon, from same.

9.—Limes, from W. H. Backus.

These analyses show some interesting and important points of difference between the several fruits. The Navel shows the highest total sugar and lowest acid of all; and this is true

equally of the earlier and later samples, *a* and *b*. The Mediterranean Sweet stands next in sugar percentage; its acid is a little higher than that of the St. Michaels in absolute percentage, but the proportion between sugar and acid is practically identical in the two, the juice of the St. Michaels being a little weaker in both substances. The Malta Blood is a little lower in sugar than the St. Michaels, but exceeds it in acid by 50 per cent in the earlier sample.

It thus would seem that, apart from its inviting outward appearance, the Riverside Navel owes its place in public favor to three chief points: A high degree of sweetness, with a low degree of acid, and the firmness of flesh which invites it to be actually eaten instead of "sucked," as one is tempted to do with the other, softer oranges.

The Mediterranean Sweet and the St. Michaels dispute precedence, according as individual tastes differ in respect to size and flavor; but the St. Michaels seems to have a greater firmness of flesh in its favor. The refreshing acidity and peculiar flavor of the Blood orange place it in a different category from the other three.

The first six columns, however, furnish food for additional considerations, especially when oranges are sold by the piece or thousand and not by weight. The Mediterranean sweet shows a slightly heavier weight than the Navel, but the larger proportion of pulp in the latter more than makes up for the difference. Owing to an accident, the proportion of juice to pulp was not determined in the case of the Mediterranean Sweet; in the Navel the figures show it to have been about 59 per cent, whereas in the St. Michaels it goes as high as 65.6, in the Malta to 66.3 per cent. The latter two are, therefore, quite materially more juicy than the navel, hence more delicate in transportation. The St. Michaels shows the highest percentage of pulp of all, notwithstanding the relative abundance of seeds; and hence a given weight of this variety would furnish the largest amount of eatable pulp, while if bought per thousand, the light weight of the fruit would leave the consumer materially "short," as compared with the Navel or Mediterranean Sweet.

Comparing the earlier fruit with that analyzed six weeks later, there is in the case of both the Navel and St. Michaels a decided decrease of both sugar and acid; exactly the reverse of what would have been looked for, as these ingredients might have been supposed to be concentrated by evaporation. There is therefore a true deterioration in oranges kept beyond the point of proper ripeness, that amply justifies the preference of consumers for the freshest fruit.

As regards the lemons, the comparison between the Lisbon and Eureka tells strongly in favor of the latter. It is larger and has a higher percentage of pulp as well as of juice, while at the same time the latter is considerably richer in citric acid. Assuming 7 per cent as the usual average, it will be noted that the Eureka is nearly as much above it as the Lisbon is below. The limes stand nearly at the same point as the Lisbon, but show a considerably higher proportion of pulp as well as of juice than either of the two lemons, being fully 13 per cent above the Lisbon in the latter respect.

While these comparisons will probably hold good in general as between these varieties, the absolute figures (percentages) must be taken with allowance for the peculiarity of the season of 1884, with its unusual rains and low temperature. A reference to the analysis made in 1879 (see the report of the College of Agriculture for that year, pp. 59 and 60) shows a much higher average of both sugar and acid for the oranges, and of acid for the lemons; the proportion of pulp also seems to have been higher throughout.

Analyses of Waters.

Artesian water from a well 43 feet deep, on the land of Mr. P. C. Phelps, of Upper Lake, Lake county. The locality is three and one-half miles north of Clear Lake, in the valley. "In boring this well the first ten feet showed gravel and sediment, the remaining 33 feet blue clay with tule roots. The flow of water is at the rate of 125 gallons per hour, together with a great deal of gas, which will burn with a blue flame (marsh gas) through a pipe four and one-half inches in diameter. There is a cover on the pipe 20 inches above the spout, and the stream of water takes up one-half of the spout."

The water proves to be saturated with carbonic acid gas, which of course also accompanies the combustible gas. It is clear and without perceptible taste. On boiling it becomes turbid; on evaporation it leaves a white residue amounting to 11.6 grains per gallon, which on heating loses 3.3 grains of water with a little organic matter. Of the remaining 3.8 grains only one grain is again soluble in water, while 7.3 remain insoluble.

The soluble part consists in the main of sodium chloride or common salt, with a little carbonate of soda.

The insoluble part, constituting the main bulk of the mineral contents, consists essentially of the carbonates of lime and magnesia in about equal proportions, with a little iron and silica.

The mineral contents of this water are quite

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within the limits of good potable waters, and the nature of the ingredients is equally unobjectionable in the proportions found. It is well adapted to domestic use, and its hardness in the use of soap can easily be remedied by the addition of a little washing ammonia. The carbonic gas imparts a refreshing taste.

Water from "Walter Soda Springs," Napa county. Sent by Mr. Gust. Walter, of San Francisco. This water as received was slightly turbid, and showed a sediment of rust-colored floccules, showing its "chalybeate" character. Carbonic acid gas escapes abundantly when the bottle is opened.

On boiling the water becomes quite turbid, and shows by its alkaline reaction the presence of some carbonate of soda.

On evaporation it leaves a residue of 143.8 grains of solid matter, which by heating to redness loses 58.0 grains of water and a little or-

ganic matter, leaving 85.8 grains of purely mineral matter. Of this there is

Again soluble.....	32.8 grains
Insoluble.....	53.0 "

The soluble part consists largely of chloride of sodium or common salt, with smaller amounts of the carbonate and sulphate of soda.

The insoluble part consists largely of carbonate of magnesia, with some carbonate of lime and silica. The fresh water contains in addition, as above stated, some iron in the shape of carbonate. All these are kept in solution by the free carbonic acid which renders the water effervescent and refreshing to the taste.

This is, therefore, a mineral water of moderate strength of tonic and the same time slightly purgative qualities; the drinking of which doubtless be advantageous in many chronic disorders.

E. W. HILGARD.

Berkeley, May 22, 1835.